

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A multicast publish/subscribe messaging system comprising a broker and a plurality of subscribers, the multicast publish/subscribe messaging system comprising:

a processor of a computer performing steps comprising:

the broker, wherein the broker operates to maintain at least one active connection between the broker and at least one subscriber of the plurality of subscribers, the broker comprising:

determining means for determining which subscribers of the plurality of subscribers have an active connection to the broker; and

informing means for informing subscribers determined to have an active connection to the broker to set a timer to run for less than a predetermined amount, wherein the subscribers of the plurality of subscribers that are determined to have an active connection to the broker send an indication of liveness at expiry of their timer;

a first subscriber of the plurality of subscribers including a liveness indicator for indicating liveness to the broker, the liveness indicator comprising:

designating means for designating the first subscriber of the plurality of subscribers to register interest in a topic as a primary subscriber;

informing means for informing the primary subscriber that the primary subscriber is responsible for periodically indicating liveness to the broker, wherein the indicating liveness to the broker is sent over a live connection;

setting means, responsive to the primary subscriber detecting a first indication of liveness, for setting a timer, wherein the primary subscriber does not send additional indications of liveness to the broker prior to expiry of the timer, and wherein the first

indication of liveness indicates that the primary subscriber intends to send an indication of the primary subscriber's presence to the broker;

cancelling means, responsive to the primary subscriber detecting a second indication of liveness from another subscriber of the plurality of subscribers prior to expiry of the timer, for canceling the timer; and

sending means, responsive to expiry of the timer, for ~~sending the primary subscriber to send~~ a third indication of liveness from the primary subscriber to the broker, wherein at least one of the first indication of liveness, the second indication of liveness, and the third indication of liveness is piggybacked onto another message.

2. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, wherein the sending means comprises:

means for multicasting a packet indicating that the primary subscriber intends to send an indication of the primary subscriber's presence to the broker; and

means for sending a presence indication to the broker from the primary subscriber.

3. (Cancelled)

4. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, wherein the cancelling means comprises:

means for determining whether a desired number of subscribers of the plurality of subscribers have indicated liveness, and that the broker is aware of the presence of at least one subscriber; and

means, responsive to determining that a desired number of subscribers of the plurality of subscribers have indicated liveness and that the broker is aware of the presence of at least one subscriber, for cancelling the timer and starting a new timer.

5. (Currently Amended) The multicast publish/subscribe messaging system of claim 4, further comprising:

means for receiving and storing a max value, wherein the max value represents the desired number of subscribers.

6. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, wherein an active connection is maintained between the broker and at least one subscriber of the plurality of subscribers in the multicast publish/subscribe messaging system, the at least one subscriber of the plurality of subscribers further comprising:

means for using the active connection to send an indication of the at least one subscriber's presence to the broker.

7.-8. (Cancelled)

9. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, wherein at least one of the first indication of liveness, the second indication of liveness, and the third indication of liveness is sent over one of:

a unicast data protocol (UDP) connection;
a transmission command protocol (TCP) connection; and
a point-to-point protocol.

10. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, further comprising:

receiving means for receiving an indication from the broker that the broker is aware of the presence of at least one subscriber of the plurality of subscribers.

11. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, wherein the broker ~~is operable~~ operates to maintain at least one active connection between the broker and at least one subscriber of the plurality of subscribers, the broker comprising:

means for determining which subscribers of the plurality of subscribers have an active connection to the broker; and

means for informing subscribers of the plurality of subscribers that have an active connection to the broker to set a timer, wherein the subscribers of the plurality of subscribers that have an active connection to the broker send an indication of liveness at expiry of their timer.

12.-13. (Cancelled)

14. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, comprising:

means, responsive to a failure of the primary subscriber, for designating a second subscriber of the plurality of subscribers whose indication of liveness is next received as a new primary subscriber, wherein the designation of the primary subscriber is changed from the first subscriber to the second subscriber.

15. (Cancelled)

16. (Currently Amended) The multicast publish/subscribe messaging system of claim 1, wherein the broker comprises:

means for listening in on a multicast channel, used by the plurality of subscribers, receiving indications of liveness from any of said plurality of subscribers.

17. (Currently Amended) A method for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the method comprising:

a processor of a computer performing steps comprising:

determining which subscribers of the plurality of subscribers have an active connection to the broker, wherein the broker operates to maintain at least one active connection between the broker and at least one subscriber;

informing subscribers of the plurality of subscribers determined to have an active connection to the broker that their timer should be set to run for less than a predetermined amount;

designating a first subscriber of the plurality of subscribers to register interest in a topic as a primary subscriber;

informing the primary subscriber that the primary subscriber is responsible for periodically indicating liveness to the broker, wherein the indicating liveness to the broker is sent over a live connection;

responsive to detecting a first indication of liveness at the primary subscriber, setting a timer, wherein the primary subscriber does not send additional indications of liveness prior to expiry of the timer, and wherein the first indication of liveness indicates that the primary subscriber intends to send an indication of the primary subscriber's presence to the broker;

responsive to the primary subscriber detecting a second indication of liveness from another subscriber of the plurality of subscribers prior to the expiry of the timer, cancelling the timer; and

responsive to expiry of the timer, ~~the primary subscriber~~ sending a third indication of liveness from the primary subscriber to the broker, wherein at least one of the first indication of liveness, the second indication of liveness, and the third indication of liveness is piggybacked onto another message.

18. (Previously Presented) The method of claim 17, wherein the primary subscriber sending the third indication of liveness to the broker comprises:

multicasting a packet indicating that the primary subscriber intends to send an indication of the primary subscriber's presence to the broker; and

sending a presence indication to the broker from the primary subscriber.

19. (Cancelled)

20. (Previously Presented) The method of claim 17, wherein the cancelling step comprises: determining whether a desired number of subscribers of the plurality of subscribers have indicated liveness, and that the broker is aware of the presence of at least one subscriber; and

responsive to determining that a desired number of subscribers of the plurality of subscribers have indicated liveness and that the broker is aware of the presence of at least one subscriber, cancelling the timer and starting a new timer.

21. (Previously Presented) The method of claim 20, further comprising:

receiving and storing a max value, wherein the max value represents the desired number of subscribers.

22. (Currently Amended) The method of claim 17, wherein the broker ~~is operable~~ operates to maintain at least one active connection between the broker and at least one subscriber of the plurality of subscribers, the method further comprising:

using one of the at least one active connection to send an indication of the at least one subscriber's presence to the broker.

23.-24. (Cancelled)

25. (Previously Presented) The method of claim 17, wherein at least one of the first indication of liveness, the second indication of liveness, and the third indication of liveness is sent over one of:

- a unicast data protocol (UDP) connection;
- a transmission command protocol (TCP) connection; and
- a point-to-point protocol.

26. (Previously Presented) The method of claim 17, comprising:

receiving an indication from the broker that the broker is aware of the presence of at least one subscriber of the plurality of subscribers.

27. (Currently Amended) The method of claim 17, wherein the broker ~~is operable~~ operates to maintain at least one active connection between the broker and at least one subscriber of the plurality of subscribers, the method further comprising:

determining which subscribers of the plurality of subscribers have an active connection to the broker; and

informing subscribers of the plurality of subscribers that have an active connection to the broker to set a timer, wherein the subscribers of the plurality of subscribers that have an active connection to the broker send an indication of liveness at expiry of their timer.

28.-29. (Cancelled)

30. (Previously Presented) The method of claim 17 comprising:

responsive to a failure of the primary subscriber, designating a second subscriber of the plurality of subscribers whose indication of liveness is next received as a new primary subscriber, wherein the designation of the primary subscriber is changed from the first subscriber to the second subscriber.

31. (Cancelled)

32. (Previously Presented) The method of claim 17, further comprising:
listening in on a multicast channel, used by the plurality of subscribers for receiving indications of liveness from any of said plurality of subscribers.

33. (Currently Amended) A computer program element in a ~~data-carrier~~ computer readable storage medium for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the computer program element comprising program code means to cause a processor of a computer to perform steps of:
determining which subscribers of the plurality of subscribers have an active connection to the broker, wherein the broker operates to maintain at least one active connection between the broker and at least one subscriber;
informing subscribers of the plurality of subscribers determined to have an active connection to the broker that their timer should be set to run for less than a predetermined amount;

designating a first subscriber of the plurality of subscribers to register interest in a topic as a primary subscriber;

informing the primary subscriber that the primary subscriber is responsible for periodically indicating liveness to the broker, wherein the indicating liveness to the broker is sent over a live connection;

responsive to detecting a first indication of liveness at the primary subscriber, setting a timer, wherein the primary subscriber does not send additional indications of liveness prior to expiry of the timer, and wherein the first indication of liveness indicates that the primary subscriber intends to send an indication of the primary subscriber's presence to the broker;

responsive to the primary subscriber detecting a second indication of liveness from another subscriber of the plurality of subscribers prior to expiry of the timer, cancelling the timer; and

responsive to expiry of the timer, ~~the primary subscriber~~ sending a third indication of liveness from the primary subscriber to the broker, wherein at least one of the first indication of liveness, the second indication of liveness, and the third indication of liveness is piggybacked onto another message.